



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 4  
ATLANTA FEDERAL CENTER  
61 FORSYTH STREET  
ATLANTA, GEORGIA 30303-8960

JUN 13 2013

David O'Connor  
Meritor, Inc.  
2135 West Maple Street  
Troy, Michigan 48084

Subject: Review of 2011 Annual Monitoring Report  
Grenada Manufacturing, Inc.  
Grenada, Mississippi  
MSD 007 037 278

Dear Mr. O'Connor:

The 2011 Annual Monitoring Report was submitted to the U.S. EPA in accordance with the 2010 Hazardous and Solid Waste Amendments (HSWA) permit for the Grenada Manufacturing site, located in Grenada, Mississippi. The EPA has reviewed this report and offers the attached comments for the revision of the 2011 report and also for the preparation of the 2012 report.

Please revise the 2011 report in accordance with the comments herein, and incorporate these modifications, in addition to the other information requested, into the 2012 report as well. The revised 2011 Annual Monitoring report should be submitted to the EPA within 30 days of receipt of this letter.

Thank you for your cooperation on this project as we work to develop a better understanding of site characteristics, contaminant fate and transport, and remediation effectiveness. I am available to discuss these comments with you, so please don't hesitate to contact me at 404-562-8608 or [anderson.meredith@epa.gov](mailto:anderson.meredith@epa.gov) if you have any questions.

Sincerely,

A handwritten signature in black ink, reading "Meredith C. Anderson".

Meredith C. Anderson  
Sr. Corrective Action Project Manager  
RCRA Division

cc: Jim Peeples, T & M Associates

EPA Comments on the  
2011 Annual Monitoring Report  
Grenada Manufacturing, Inc.  
Grenada, Mississippi

June 13, 2013

## **General Comments**

### **Effectiveness of Permeable Reactive Barrier:**

As the EPA and Meritor have discussed previously, the hydraulics of the Permeable Reactive Barrier (PRB) appear to be minimally understood. An understanding of the residence time of groundwater within the PRB and time of travel along the flowpaths, both upgradient and downgradient of the PRB, are critical in evaluating the performance of the PRB and optimization of the system, as necessary, to achieve the site remediation goals. The 2011 Annual Monitoring Report only superficially addresses hydrology of the site by including water level measurements, potentiometric surface contours, and estimates of hydraulic gradient. However, no estimates of groundwater flow rates and contaminant migration rates are derived based on these measurements. Hydrogeological data such as hydraulic conductivity values in upper and lower shallow aquifer, estimates of porosity, organic carbon, and contaminant partitioning coefficients should be used to assess contaminant migration rates both upgradient and downgradient of the PRB. The 2012 annual monitoring report should include a presentation of this information.

The EPA has previously expressed concerns regarding the possibility that trichloroethylene (TCE) may be migrating to the north and south of the PRB. The uncertainty regarding the flowpaths towards and around the PRB can be assessed using a groundwater flow model for the PRB and the vicinity. A regional MODFLOW/MT3D model was developed for conducting groundwater fate and transport modeling and was completed as a pre-design study for the sheet pile barrier concept, which was eliminated from further consideration based on the fate and transport modeling results. Since a regional MODFLOW/MT3D model is already available, the model can be easily updated and used to assess the change in flow and transport characteristics as a result of the installation of the PRB. Meritor should update the model in order to make this assessment and use the results to evaluate the PRB performance in the 2012 annual monitoring report.

### **Conceptual Site Model:**

The current Conceptual Site Model (CSM) does not adequately describe site groundwater flow and fate and transport of site contaminants, especially in the lower portion of the shallow aquifer. The number and distribution of monitoring wells screened in the lower portions of the surficial aquifer is sparse compared to the number of wells screened in the shallow portions of the upper aquifer. As a result, the lower portion of the upper aquifer is not adequately characterized for groundwater flow or contaminant distribution. A thorough evaluation of the contaminant distribution and flow characteristics of the lower portion of the surficial aquifer should be

conducted using the comprehensive 2012 monitoring data. This is crucial not only for the assessment of the effectiveness of the PRB, but also for assessing whether contaminants found offsite near MW-20 could be migrating from source areas in lower portions of the upper aquifer within the facility.

The data collected to date and as interpreted in this report suggest that there are some data gaps in defining the plume boundaries. The concentration contours presented in the 2011 Annual Monitoring Report do not adequately define the contaminant distribution and appear to be inconsistent with plume diagrams presented to the EPA at a previous meeting. In drawing the contours, the most recent data available from monitoring wells not sampled in 2011 should be used as necessary for adequate depiction of the plumes. Following the sampling schedule presented in Table 1-1, a comprehensive quadrennial sampling event was scheduled for 2012. Furthermore, additional monitoring wells were installed in 2012 as outlined in the MW-20 Area Investigation Work Plan (September 2012). Therefore, sufficient data should be available to provide a thorough description of site conditions, updated CSM, comprehensive PRB performance evaluation, and recommendations for enhancing contaminant attenuation in the 2012 annual monitoring report. The 2012 annual monitoring report should also include comprehensive plume contours drawn to the Maximum Contaminant Levels (MCLs) and cross-sections showing vertical distribution of contaminant concentrations.

#### **Timeframe to Meet Site Remediation Goals:**

The EPA continues to be concerned that elevated levels of site contaminants still exist in areas of the Grenada site. Source control has been conducted at several SMWUs, and a site-wide groundwater remedy has been constructed to treat groundwater contamination originating at the main plant area. While some on-site monitoring wells are exhibiting a decline in contaminant concentrations since the construction of the PRB, other wells are showing little or no decline in contamination, raising the issue of the overall timeframe needed to reach site remediation goals and whether all source areas have been identified and addressed.

The EPA and Meritor have had numerous discussions about the performance of the site-wide groundwater remedy (PRB) at the Grenada site, and Meritor has taken steps to investigate additional areas of uncertainty to provide a better understanding of the groundwater contamination at the Grenada site (in the area of the PRB and in the MW-20 area). In addition, the groundwater monitoring program required comprehensive groundwater monitoring throughout the site in 2012. This comprehensive data set, combined with the updated site-wide flow model and the additional information obtained from the PRB and MW-20 areas, allows for the detailed evaluation of the overall effectiveness of the site-wide remedy and an estimate of the timeframe to reach site remediation goals. This type of presentation should be included in the 2012 annual monitoring report.

### **Specific Comments**

(Unless otherwise noted, the items below should be incorporated into the 2011 Annual Monitoring Report and re-submitted to the EPA.)

**p. 1-3, 3<sup>rd</sup> paragraph:**

Please revise Figure 1-3 to indicate the location of all 27 SWMUs and 3 AOCs.

**p. 1-4, Section 1.3 Summary of Remedial Actions**

Please include a discussion in this section of the remedial actions undertaken at all SWMUs and AOCs listed on Figure 1-4 (current discussion does not include SWMUs 12, 13, 15, and AOC C).

**p. 1-10, Section 1.4 Site Conceptual Model**

This section (and Figure 1-6) does not adequately describe the hydrogeologic conditions at the site and needs to be enhanced (see comment above in General Comments section). The generalized direction of groundwater flow at the site should be discussed as part of the CSM. Site features not included in Figure 1-6, but that are integral to a complete CSM include, but are not limited to: contamination distribution in aqueous, sorbed, and nonaqueous phase liquid (NAPL) phases and mass transfer processes. The CSM should also include a discussion of basic hydrogeological characteristics of the site such as estimates of hydraulic conductivity, groundwater flow, and other results of the updated flow model. Also, please provide a more detailed discussion of data to support the statement in paragraph 2 that the lower aquifer has not been impacted by site contaminants. This should also be a part of the Site Conceptual Model.

**p. 2-1, Section 2 Monitoring Strategy and Methods**

The statement that each of the well locations surrounding the PRB contains a shallow and deep monitoring well is not correct. The MW-14 location only had a shallow well in 2011; the paired deep well was not installed until 2012.

**p. 3-1, Section 3.1 Groundwater Flow**

Please include additional monitoring well construction details, such as the depth intervals of the monitoring well screens and depth to the clay layer, for wells listed in Table 3-1. This section should also include a discussion of seasonal variations in water table depth observed during the Spring and Fall 2011 sampling events and a comparison of 2011 water level measurements to historical measurements.

As discussed above, the MODFLOW/MT3D model previously used at the site should be updated to assess groundwater flow and contaminant fate and transport predictions across the site and in the PRB area (and included in the 2012 annual monitoring report).

Figures 3-3 and 3-4 demonstrate that there are significant data gaps in the water-level data for the lower portion of the surficial aquifer upgradient of the PRB. The dashed lines for potentiometric surface contours upgradient of the PRB are based on data from only three wells (MW-54, MW-9 and MW-8). The water levels measured in MW-9 during both the Spring and Fall sampling events were significantly higher than the water-level measurements in MW-54 and MW-8. However, the dashed contour lines east and west of MW-9 contradict the data measured at MW-

9 and incorrectly imply that a fairly uniform gradient exists from east to the west towards the PRB. The very limited data from wells screened within the lower portion of the surficial aquifer suggest a groundwater divide may exist near MW-9, and the flow gradients in the lower portion may vary from the shallow portion of the upper aquifer. Table 3-1 includes a note stating that MW-9 is an Artesian well, but there is no note on the figure to indicate that the data from this well was disregarded in drawing the contours. Table 1-1 indicates that this well is a deep well in the upper aquifer, although well depth noted in Table 3-1 suggests this well may be screened in the lower aquifer. If this well is screened in the lower aquifer (and not in the deeper portion of the upper aquifer as indicated in the figures), it should be labeled as such and the data from this well should not be included in the potentiometric surface map for the lower portion of the upper aquifer. The 2011 Annual Monitoring Report should be updated accordingly. The potentiometric surface in the lower portion of the surficial aquifer needs further assessment, especially in light of the recent discovery of TCE near off-site well MW-20 in the perceived cross-gradient direction from the sources within the facility boundary. Only the area near the PRB has a sufficient number of wells to define the contours in the lower portion of the surficial aquifer. A supplemental investigation should be planned to better assess the potentiometric surface in the lower portion of the surficial aquifer. This will also provide insight as to the potential for any migration from onsite sources towards MW-20 in the lower portion of the surficial aquifer.

**p. 3-1, Section 3.2 Groundwater Quality**

The dashed concentration contours shown in the figures (Figures 3-7 through 3-12) imply that they are inferred over the entire site. The figures do not show the extent of the plume that exceeds the MCLs, and do not adequately depict the source areas. However, plume maps shared with the EPA at the September 2011 meeting included more thorough depictions of concentration contours. Revise the report so that contours are drawn similar to those in the September 2011 meeting, using most recent data collected from all monitoring wells. The report should also discuss data gaps in defining the nature and extent of the plumes. Temporary well points using direct push technology can be used for vertical plume delineation and lateral delineation of the plume boundary to the MCLs.

With so few deep wells upgradient of the PRB, it is unclear how the contaminant concentration contours can be estimated for the lower portion of the shallow aquifer (Figures 3-11 and 3-12). The report should discuss these data gaps in defining the nature and extent of the plumes in the deeper area. Temporary well points using direct push technology can be used for vertical plume delineation and lateral delineation of the plume boundary to the MCLs.

**p. 3-2, Section 3.2.1 PRB Corrective Measures Monitoring Results**

In the discussion regarding the impact of the PRB on the contaminant concentrations in downgradient wells, estimates of travel times are needed to assess the PRB influence on concentration trends in the downgradient wells. An assessment of PRB performance cannot be completed without estimates of contaminant travel times from the PRB to the downgradient monitoring wells. In the 2012 annual monitoring report, provide estimates of the contaminant travel times from the PRB to downgradient wells as well as to Riverdale Creek.

Some discussion on the vertical distribution of contaminants is needed for the complete evaluation of the effectiveness of the PRB. Figures showing vertical distribution of



contaminants upgradient and downgradient of the PRB would be useful and should be included in the 2012 annual monitoring report using the more comprehensive 2012 data. The concentration data suggest that the plume may be migrating deeper downgradient of the PRB, indicating either the effectiveness of the PRB is limited within the upper portion of the surficial aquifer or contaminated groundwater is flowing beneath the PRB. Based on the monitoring data, the PRB appears to be most effective near the location of MW-41 and MW-42.

**p. 3-5, Section 3.5 Surface Water Results**

Please reference the trend graphs provided in Appendix C. Also, the trend graphs for metals results should not include the MCLs, but rather the criteria indicated in Table 3-8.

**p. 3-5, Section 3.6 Sediment Sampling Results**

Please provide trend graphs of the sediment results to facilitate this discussion.

**p. 3-6, Section 3.8 Monitoring Program Evaluation**

Additional wells were installed in 2012 at the PRB to provide a better understanding of the PRB effectiveness and in the MW-20 area to better define potential off-site migration of site contaminants. As this is part of the monitoring program evaluation, this section should discuss this additional work that was proposed in 2011 (and carried out in 2012).

**p. 4-1, Section 4 Summary of Findings**

There are no snap shots of historical plume boundaries included in the report or analysis presented in earlier sections to support the summary statement in the 2nd bullet that the plume configuration and boundary has remained consistent with historical data with few exceptions. The plume configurations shown in this report for TCE (Figures 3-7 and 3-11) are not generally consistent with the 2004 plume maps presented in the September 2011 meeting with the EPA. Include additional discussion in prior sections to support this summary statement. Also, the statement that the deeper portion of the surficial aquifer generally exhibits lower concentrations of contaminants than the shallow portion is not substantiated by data (see well cluster MW-08 and MW-11). At this point in time, it is unclear if the deeper portion of the surficial aquifer has been characterized adequately.

The third bullet stating that the PRB is effective at reducing contaminant concentrations in groundwater is too generalized. The effectiveness of the PRB is not uniform across its length based on monitoring data collected to date. Please delete any conclusion regarding the effectiveness of the PRB from the 2011 Annual Monitoring Report and state that results from the additional investigation undertaken in 2012 are needed to make a determination regarding the effectiveness of the PRB.

The 5<sup>th</sup> bullet states that the long-term trend of contaminant concentrations in the post-closure monitoring wells at the Equalization Basin are showing a gradual decline. While this may be partially true, it is important to note that the concentrations of TCE in all 5 wells are well above the MCL for TCE, with RT-2 and RT-3 exhibiting levels of TCE up to 2000 times the MCL (could this area be the source of TCE in the off-site area near MW-20? Do we have information about the deeper portion of the aquifer in this area?). This bullet should be revised to include a discussion of these elevated levels of site contaminants.

**Figures 3-5 and 3-6**

The well MW-5 is mislabeled as RT-5 in the data box for MW-5. Also, please highlight or shade those results on the data boxes that exceed the MCL (Figure 3-6, as well). On Figure 3-6, since MW-8 was not sampled in 2011, please delete the data box for this location.

**Figures 3-11 and 3-12**

Please delete the "NS" notation from MW-8 (unless this notation is added for all deep wells not sampled in 2011).

**Figure 3-13**

Contaminant concentration contours should be added to this figure.

**Tables 3-7 and 3-8**

These tables should include a footnote to explain what the highlighted and shaded data represent.

**Tables 3-9 and 3-10**

The tables should include the sediment criteria applied to evaluate the results, and a footnote to explain what the bold data represent.

**Appendix C**

Please add a notation to all trend graphs indicating when the PRB was installed. Also, 2011 sampling results for MW-42 and MW-43 are not included on the trend graphs for these wells.

